Clinical and Radiologic Manifestations of Bone Infection in Children with Cat Scratch Disease

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We identified 13 patients with cat scratch (*Bartonella henselae*) bone infection among those admitted to a large tertiary care children's hospital over a 12-year period. The median age was 7 years and the median time from onset of illness to diagnosis was 10 days. Multifocal osteomyelitis involving spine and pelvis was common; no patient had a lytic bone lesion. Median treatment duration was 28 days (IQR, 24.5 days). Despite significant variations in treatment duration and antimicrobial therapy choices, all patients showed improvement. *(J Pediatr 2018;■■:■■-■■).*

Cat scratch disease (CSD), which has a worldwide distribution, is caused by *Bartonella henselae*, a facultatively intracellular gram-negative bacillus.[1] The typical reservoir is cats (particularly young kittens) that transmit the infection to humans after a scratch or bite. The predominant clinical feature is a regional lymphadenopathy that resolves spontaneously within 2-4 months.[1] Extranodal manifestations with systemic or severe disease are reported in 5%-15% of patients with CSD.[2-6] Of these atypical manifestations, bone involvement with CSD seems to be particularly uncommon. Two reviews of CSD including >3000 patients revealed osteomyelitis in 0.27% of all reported patients.[2,7] We reviewed cases of CSD bone infection at Nationwide Children's Hospital as well as a larger group of patients with cat scratch osteomyelitis reported previously in the medical literature to better characterize clinical and laboratory findings and patient outcomes (**Table I**; available at www.jpeds.com).[2,4,8-54]

Methods

This retrospective study was performed at Nationwide Children's Hospital, Columbus, Ohio. Electronic medical records of patients with a diagnosis of CSD and osteomyelitis during January 1, 2006, to December 20, 2017, were reviewed using *International Classification of Diseases,* 9th or 10th edition, codes for CSD and osteomyelitis. Patients ≤18 years of age were included if they had either positive *B henselae* IgG and/or IgM antibodies or *B henselae* polymerase chain reaction (PCR) detected from bone biopsy. Patients were excluded if they had any other bacterial cultures and/or bacterial PCR positive from blood and bone tissue. Patients who came to medical attention with CSD lymphadenitis alone were excluded. EMRs were reviewed for demographics, clinical presentation, radiologic studies, and laboratory data including complete blood counts, erythrocyte sedimentation rate, C-reactive protein, *B henselae* serology (positive serology was defined as IgG ≥1:64 and/or IgM ≥1:16), *B henselae* PCR, and biopsy results. Antimicrobial treatments, treatment duration, follow-up evaluations, and clinical outcomes were reviewed. A PubMed search using terms ("bartonella" OR "cat-scratch") AND ("osteomyelitis" OR "disseminated") was performed.

Results

Thirteen patients were identified based on positive serology, PCR and biopsy results, and imaging findings consistent with osteomyelitis in addition to clinical findings. The median age of our patients was 7 years (IQR, 4.5 years). Our patients had a prolonged course of illness before the diagnosis was made (median, 10 days; IQR, 12.5 days). All patients had fever or history of fever and pain related to the affected bone. None of the patients had detectable erythema or edema reported over the involved areas. Ten patients reported contact with cats within several weeks before symptom onset. Three patients had an underlying medical problem (asthma, autism, and complex partial seizures in 1 patient each).

Patients had normal white blood cell counts (median, 10,900/mm^3; IQR, 4.85/mm^3) and modest elevations of erythrocyte sedimentation rate (median, 52 mm/h; IQR, 15.5 mm/h) and C-reactive protein (median, 5.2 mg/dL; IQR, 3.35 mg/dL) on admission. Serologic tests in all and PCR of bone in 2 patients, PCR of inflammatory mass, and PCR of lymph node in 1 patient were positive. Four patients had negative blood PCR results. Three patients had bone biopsies, and 1 had liver and lymph node biopsy; 1 had lymph node and 1 had hip capsule biopsy. Of patients who had bone biopsies, 1 patient (patient 4, **Table II**) had tissue

CSD	Cat scratch disease
MRI	Magnetic resonance imaging
PCR	Polymerase chain reaction

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Table II. Anatomic sites, antibiotic regimens, and outcomes of patients

Patients	Age/sex	Liver, spleen, LN involvement	Vertebrae/spine*	Flat bones	Long bones	Diagnostic tests (titers,† PCR, biopsy)	Treatment (d)	Pain resolution after treatment (d)
1	5/F	Hypoechoic liver nodules, ~ 2 × 2 cm left axillary LN (NM)	C1, C2, T7 facet, and S2 (NM)	L occipital bone and condyle, 11th rib, sternum ischium (NM), dural venous thrombosis	Left distal femur diaphysis, right distal femur metaphysis, left proximal tibia	IgM >1:32 IgG >1:128 Blood, liver biopsy PCR: negative, LN aspirate PCR: positive, Biopsy: liver and LN	Rifampin (21) doxycycline (63)	42
2	12/F	Bilateral small inguinal LN	Posterior spinous processes of T3-T5, T12-L2, left alar wing of S1, lamina and pedicles of T12	Left sacral alar ring and superior right acetabulum		IgM >1:32 IgG >1:128 Blood PCR: negative Biopsy: ND	Rifampin (14) doxycycline (14)	2
3	7/M	No	L2 vertebral body			IgM negative IgG: >1:128 Biopsy: ND	Azithromycin (14)	7 (estimate based on follow-up note)
4	5/F	BL necrotic inguinal LN, maximum size 2.2 cm (US, CT)	Right T6-L1 paraspinal phlegmon, epidural abscess at T11, body of T8 and T11			IgM >1:32 IgG >1:128 T8 parainflammatory region aspirate PCR: positive Biopsy: T8	Rifampin (25) doxycycline (42)	7, readmitted with fever and pain on day 6
5	7/F	Left elbow necrotic LN, size 5.3 cm with adjacent LN (US)			Left distal humeral metaphysis, periosteal elevation (radiograph)	IgM Indeterminate IgG >1:128 LN aspirate PCR: negative Biopsy: ND	TMP/SMX (20) Rifampin (20)	2
6	7/M	Hepatosplenomegaly with multiple small hypoechoic lesions, left inguinal LN maximum size ~2.3 cm (US, CT)	T11 vertebra body, right S1 sacral ala, posterior and central S2 sacral body, S3, S4 vertebral body			IgM >1:32 IgG >1:128 Biopsy: ND	TMP/SMX (15) rifampin (35) ciprofloxacin (35)	18
7	3/M	Right lateral L5 body and psoas muscle phlegmon, intraspinal epidural extension	Left L3 pedicle, right L5 pedicle/ right vertebral body, S1 (NM)	Right fourth rib, right sacroiliitis		IgM negative IgG >1:128 Bone PCR (+) Biopsy: L5 pedicle and vertebral body	TMP/SMX (14) rifampin (10) ciprofloxacin (30, total treatment 44 d)	7

(*continued*)

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